Engineering interpenetrating network hydrogels as biomimetic cell niche with independently tunable biochemical and mechanical properties.

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Public Summary:
Hydrogels have been widely used as artificial cell niche to mimic extracellular matrix with tunable properties. However, changing biochemical cues in hydrogels developed-to-date would often induce simultaneous changes in mechanical properties, which do not support mechanistic studies on stem cellniche interactions. Here we report the development of a PEG-based interpenetrating network (IPN), which is composed of two polymer networks that can independently and simultaneously crosslink to form hydrogels in a cell-friendly manner. The resulting IPN hydrogel allows independently tunable biochemical and mechanical properties, as well as stable and more homogeneous presentation of biochemical ligands in 3D than currently available methods. We demonstrate the potential of our IPN platform for elucidating stem cell-niche interactions by modulating osteogenic differentiation of human adipose-derived stem cells. The versatility of such IPN hydrogels is further demonstrated using three distinct and widely used polymers to form the mechanical network while keeping the biochemical network constant.

Scientific Abstract:
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